

AMENDMENTS TO THE DRAWINGS:

Figures 2-3 and 5 are amended to include descriptive labels for certain features identified by boxes in the Figures.

A marked up copy of Figures 2-3 and 5 are attached Appendix A of this Reply.

Clean copies of amended Figures 2-3 and 5, identified as “Replacement Sheets”, are attached at Appendix B of this Reply.

REMARKS

Claims 1, 3-7, 9-10, 13-15 and 17-28 are pending in the application.

Claims 2, 8, 11-12 and 16 are cancelled from the application without prejudice.

Application Claim 1 is amended above to include the features of now cancelled Claim 2.

Claim 7 has been re-written in independent form and incorporating the features of now cancelled Claim 8.

Independent Claim 25 has been amended to correspond to new Claim 1, and new Claim 28 has been inserted.

Figures 2-3 and 5 are amended herein to include descriptors for certain numerical features.

No new material in introduced by way of these amendments.

The examiner's specification and claim objections and rejections are overcome or they are traversed as set forth below.

I. THE SPECIFICATION OBJECTION

The examiner objected to the specification for including a superfluous period.

The examiner's objection is overcome by amending the specification above to delete the superfluous period.

II. THE DRAWING OBJECTIONS

The examiner objected to Figures 2-3 and 5 for lacking descriptive labels.

The examiner's objection is overcome by amending Figures 2-3 and 5 to include the appropriate descriptive labels. Marked up sheets for Figures 2-3 and 5 showing Applicant's proposed Figure changes are attached at Appendix A of this paper. Replacement sheets for Figures 2-3 and 5 are attached a Appendix B of this Reply.

III. THE ANTICIPATION REJECTIONS

The Examiner rejected claims 1-8, 10-18, 20-22 and 24-27 as being anticipated by three prior art documents, namely Watson (US5659520)(claims 1-4, 7-8, 10, 13-18, 20-22 and 24-27), Munson (US4198704)(claims 1-3, 5-6 and 25) and Gravett (US 3978445)(claims 1, 11-12 and

25). All rejected claims are novel and patentable for the reasons recited below. Before identifying the differences between the claimed invention and the prior art references, the Applicant will briefly review the teachings of these documents.

Watson describes a system whereby the direction of an incident signal is determined by the phase difference between each of a number of channels corresponding to a signal received at different locations. In order to improve accuracy, the receivers are spaced further apart than the half wavelength typically used. This spacing, however, creates ambiguity, and Watson teaches the use of a coarse direction estimate derived from cross correlation of the received signals, in order to resolve the ambiguity.

Munson is over 20 years old, and describes the basic process of cross correlating the outputs of two spaced receivers in response to an incident waveform. Munson advances this basic principle to the use of three receivers.

The Gravett reference is older still, and describes the same basic concept as Munson, but includes the feature that the output of each receiver is autocorrelated, i.e., correlated with a delayed version of itself in order to eliminate broadband signals and background noise.

Turning now to independent claim 1, there is recited an apparatus whereby output pulses from a pair of spaced receivers generated in response to a single predetermined signal undergo replica correlation, before the results of this replica correlation are cross correlated together to provide a direction estimate. Replica correlation is distinct from auto correlation of Graver. Auto correlation is possible in the claimed invention because the received signal is of a known form, and therefore a replica can be produced at the receiver. Replica correlation provides more refined multipath information for use in the subsequent cross correlation step.

None of the three references cited against the novelty of the pending claims disclose the step of replica correlation prior to cross correlation. Indeed, neither Munson nor Gravett could produce a replica signal, since the received signal is not of known form, and Watson uses correlation only to provide a course estimate, and hence refinement by replica correlation would not be of use. Claim 1 is therefore considered novel and non-obvious over the cited art for at least these reasons. In addition, claims 2-6, 10, 13 and 14 are novel and patentable by virtue of their dependence upon claim 1.

Independent claim 25 is a method claim that, like claim 1, includes replica correlation. Claim 25 is therefore novel over the prior art for the same reason recited for claim 1 immediately above. Claim 28 is a newly added claim, dependent on claim 25, and recites the step of correcting received signals for Doppler prior to replica correlation. As noted above, none of the prior art teaches or disclose replica correlation prior to cross correlation, and the art certainly does not teach Doppler compensation prior to replica correlation. Claim 28 is novel and non-obvious for at least these reasons.

Claim 7 is re-written in independent form above, and additionally now incorporates the features of previous claim 8 (now cancelled). In his last communication, the Examiner considered that previous claims 7 and 8 were anticipated by Watson. This is respectfully denied. Claim 7 recites apparatus comprising a receiver for providing a pair of temporally spaced pulses in response to a predetermined signal having two pulse waveforms with a known temporal spacing. The pair of temporally spaced pulses so produced are cross correlated, and the output of the cross-correlation used to determine Doppler parameters. In other words, claim 7 requires a signal having a known time variance to be received at a receiver, which produces a pair of temporally spaced pulses in response. These temporally spaced pulses are then essentially separated, and correlated against each other to determine Doppler parameters.

As noted above, the Examiner has previously considered that features similar to those of present claim 7 are anticipated by Watson. It is respectfully submitted however, that Watson does not disclose any particular method for determining Doppler parameters. In fact, the term Doppler only arises once in the abstract of the document, with no mention whatsoever of the method or apparatus for determining Doppler.

The Examiner cites block 63 of Figure 5 of Watson in this regard. As noted in column 8 of Watson however, block 63 is a frequency estimation step used in preparation for the phase difference measurement.

It is respectfully submitted that the cross-correlation of two temporally spaced pulses, derived from a single receiver is not disclosed in Watson or any other cited reference. It is further respectfully submitted that such cross-correlation is not used as the basis for determining Doppler parameters, as required by present Claim 7. It is therefore considered that Claim 7 is novel and

non-obvious over the cited art. Claims 9, 15 and 17-24 are novel and patentable by virtue of their dependence upon claim 7.

Claim 26 is a method claim corresponding to claim 7, and was rejected by the Examiner for the reasons discussed above. For these same reasons then, claim 26 is considered novel and non-obvious over the art of record. In addition, claim 27 is novel and patentable by virtue of its dependence upon claim 26.

IV. THE OBVIOUSNESS REJECTION

The examiner rejected claims 19 and 23 for obviousness over Watson in view of Reid. The examiner also rejected claims 13-14 for obviousness over GB2336741 in view of Killiojarvi.

Claims 19 and 23 depend directly or indirectly upon independent claim 7. Claims 19 and 23 are novel and non-obvious over the cited prior art for the same reasons as recited in Section III above with respect to the novelty of claim 7. Namely, the cited prior art does not disclose or suggest the invention of claims 19 and 23 at least because Watson does not disclose any particular method for determining Doppler parameters.

Claims 13-14 depend directly or indirectly upon independent claim 1 and are believed to be non-obvious over the cited prior art for at least the same reasons set forth in Section III above. In particular, neither of the cited references discloses or suggests replica correlation.

CONCLUSION

Applicant respectfully requests favorable reconsideration and allowance of all pending application claims.

Should the Examiner have any questions, he is invited to contact the undersigned attorney at (312) 913-2123.

Respectfully submitted,

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Appendix A

(Marked Up Figures)

Fig.3.

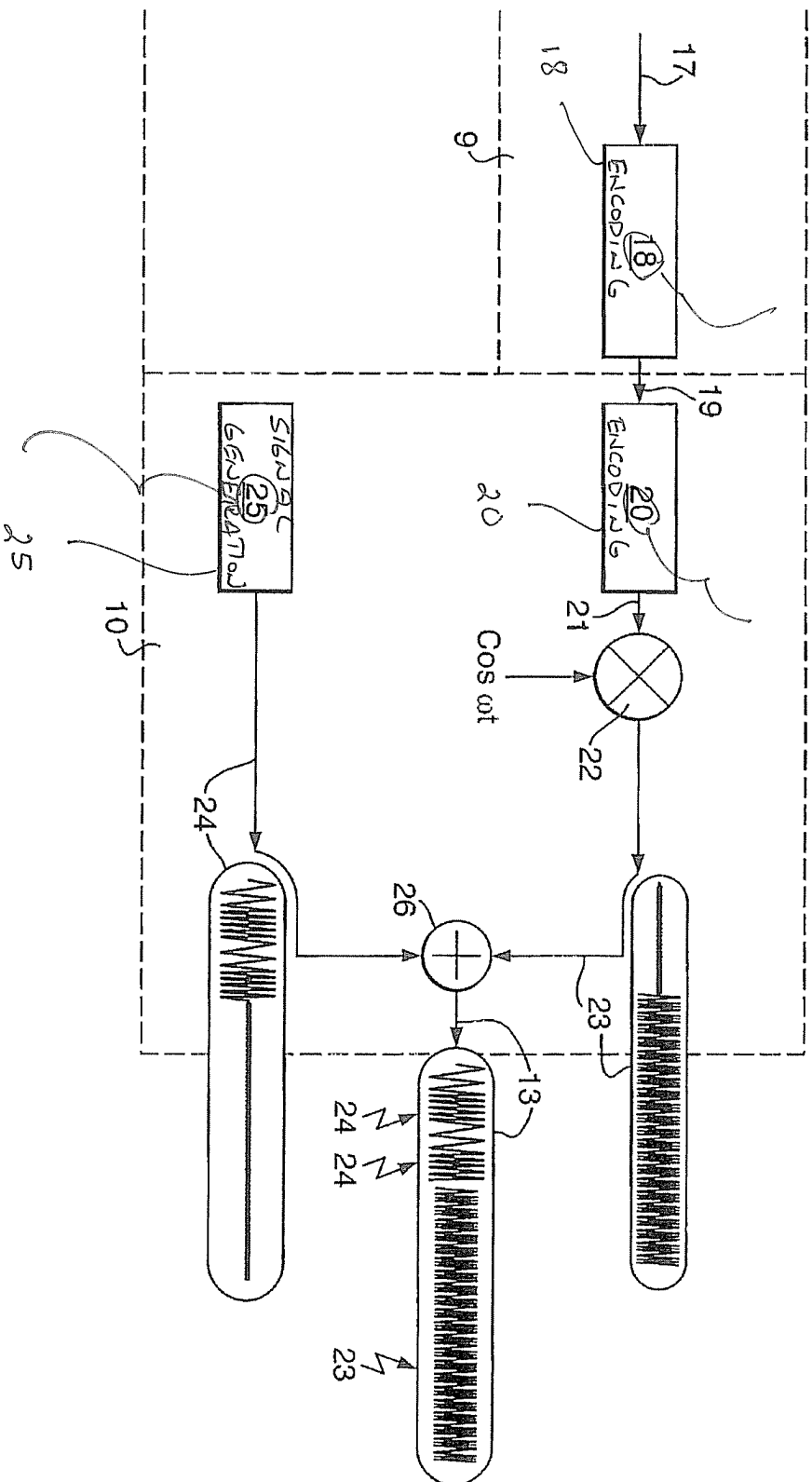
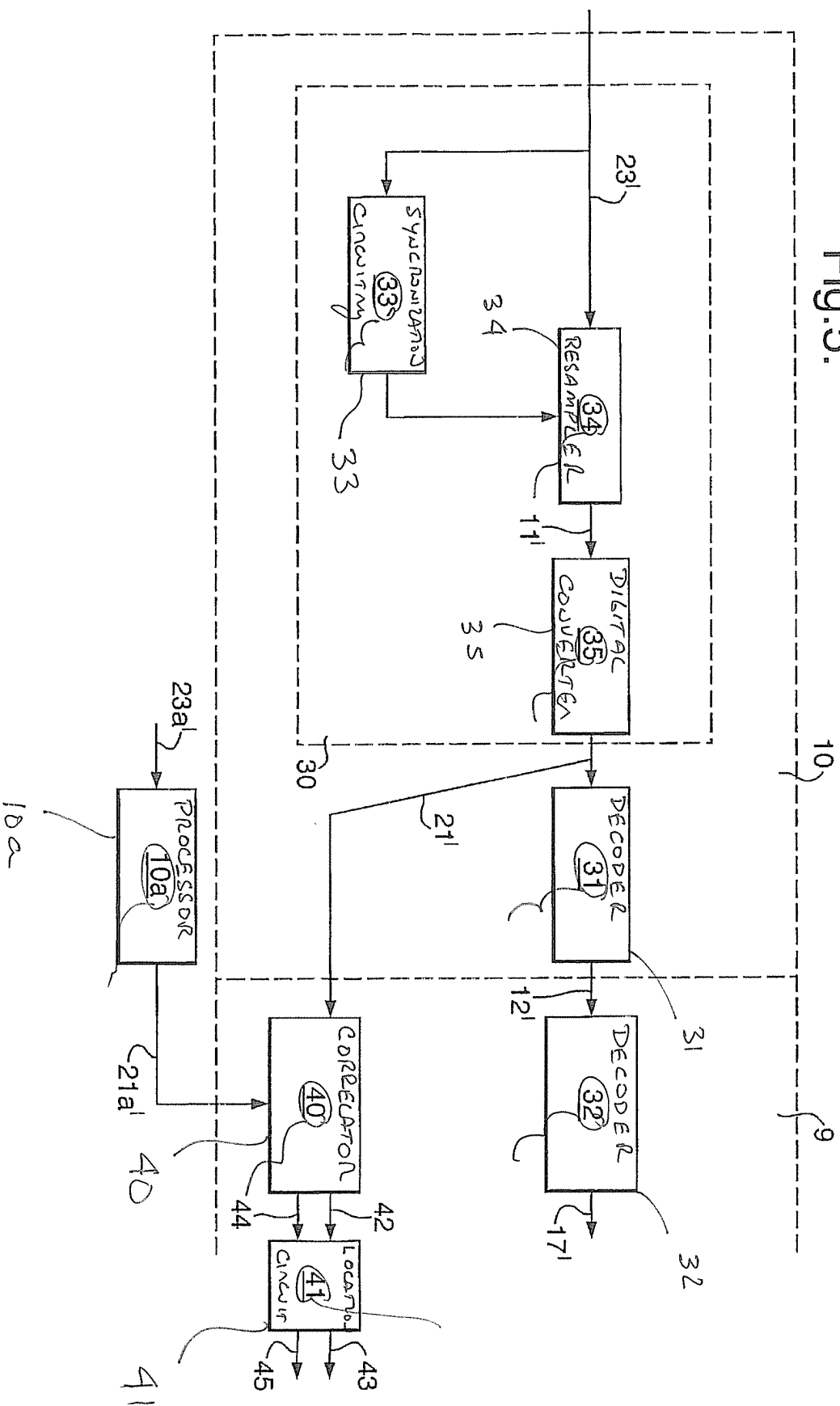
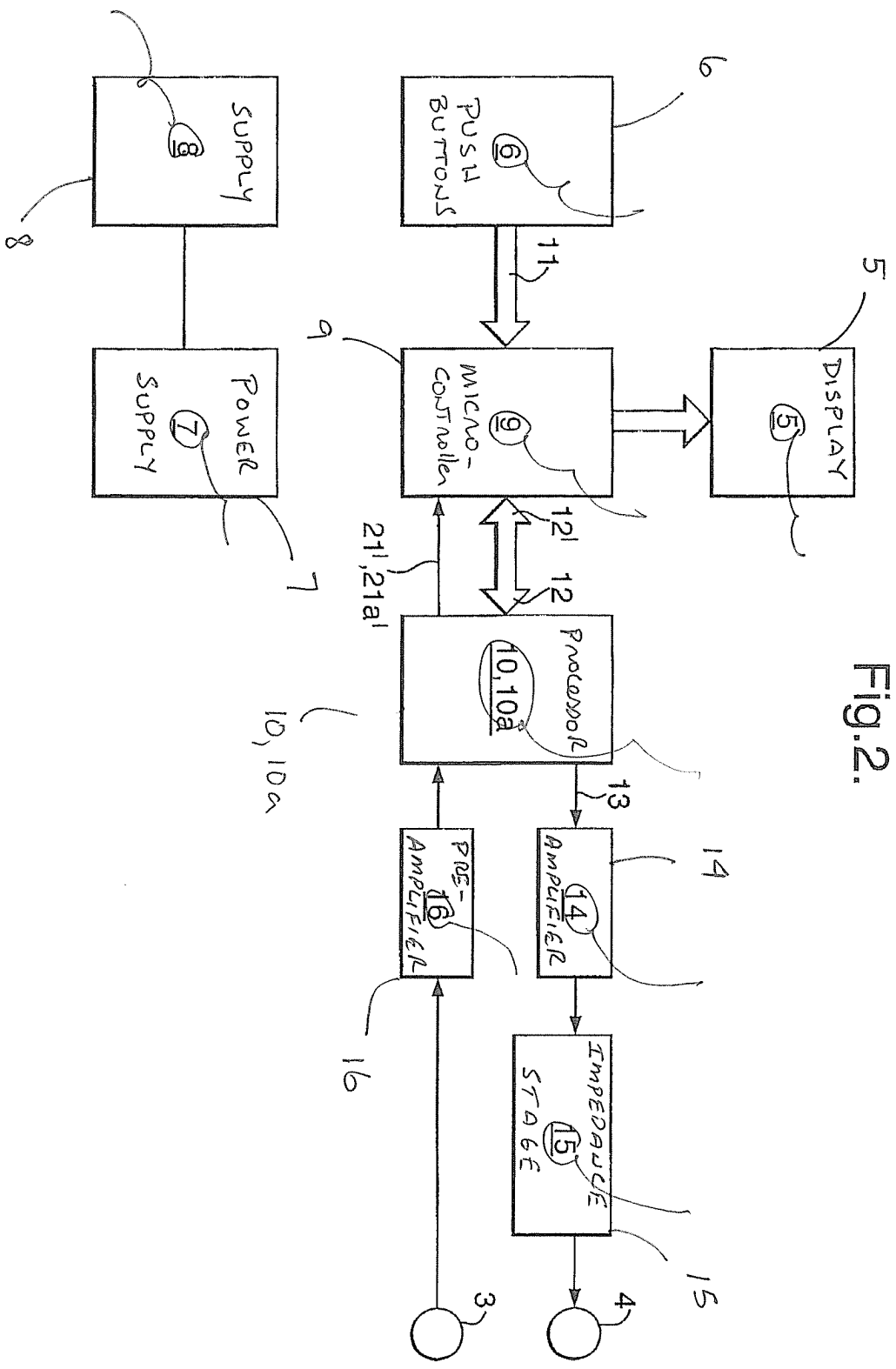


Fig.5.





Appendix B

(Replacement Figure Sheets)